

DRAFT REPORT ON INSTREAM FLOW INCREMENTAL METHODOLOGY STUDIES ON THE NORTH ANNA AND PAMUNKEY RIVERS, VIRGINIA

Responses to Public Comment

From March 4, 2009, to April 3, 2009, the Department of Environmental Quality (DEQ) coordinated an informal public comment period on the draft report summarizing the Instream Flow Incremental Methodology study conducted by Dominion Resources Inc. This study is a condition of the Nuclear Regulatory Commission's early site permit and Virginia's coastal consistency certification associated with the possible construction of an additional generating unit (Unit 3) at Dominion's North Anna power station.

The scope of the IFIM study was developed in consultation with DEQ, the Department of Game and Inland Fisheries, and the Department of Conservation and Recreation. The agency-approved "North Anna IFIM Study Plan" (dated March 28, 2007) included components that evaluated how the addition of a third unit could impact habitat for fish, other organisms, and recreation on the North Anna River and Pamunkey River. Wetlands, boat docks and ramps on Lake Anna also were studied. The completion of this IFIM study will satisfy one part of the special condition in the Commonwealth of Virginia's conditional concurrence with the coastal zone consistency determination submitted by Dominion for the proposed North Anna Power Station Unit 3.

During the comment period, questions and comments were submitted by three organizations or individuals: the Lake Anna Civic Association, Hanover County, and Mr. Harry Ruth (for the Friends of Lake Anna). As was the case throughout the IFIM study itself, representatives from Dominion, the Department of Game and Inland Fisheries, the Department of Conservation and Recreation, and the Department of Environmental Quality worked together to develop responses to each of the submitted comments.

The actual comments submitted during the comment period and the joint responses to each, including revisions to the text of the IFIM Report, are listed on the following pages. Three data tables referenced in the responses are attached in a separate document.

Lake Anna Civic Association

On April 2, 2009, the Lake Anna Civic Association (LACA) submitted comments on nine topics. Responses to each topic are included below.

1. IFIM Requirements - The IFIM study was “to address the potential impacts of the proposed Units 3 and 4 upon the fishes and other aquatic resources of Lake Anna and downstream waters,” as agreed by all parties. There is no reference to Unit 4 in the draft IFIM report. If Unit 4 was not considered because it is to be completely cooled by dry cooling and use no Lake Anna water, then this should be stated in the report.

RESPONSE: The IFIM report addresses proposed Unit #3 because that is the only facility being proposed for permitting at this time. Unit #4 is not being considered for construction, and is not part of Dominion’s proposal before the Nuclear Regulatory Commission or the Virginia resource agencies. However, if Unit #4 would be proposed in the future, no water impacts would be expected since the dry towers would use almost no water (<1 gpm on average) during operation. Text will be added to the IFIM report indicating the above.

2. Flow Rates Measured - Table A, “Transect Summary Data for the IFIM Surveys, 2007-2008” which was provided to the Lake Anna Task Force on June 24, 2008 is not presented in the draft report. These are the measured flow rates and dates for the measurements used in the report. These data should be included in the report so the reader can compare the actual flows measured to the study flows requested. Some explanation should be given as to why actual flows were different from the requested flows and why the extrapolation used to 20cfs was acceptable since it is outside the standard accepted range for IFIM studies.

RESPONSE: The IFIM study plan indicated that the field surveys would be performed with flows of approximately 40 cfs, 140 cfs, and 250 cfs measured at the Lake Anna Dam. The downstream river flows would increase from these levels as a result of natural runoff conditions at the time of the surveys. The 40 cfs release is representative of dry weather conditions resulting in a low to moderate downstream flow increase. The 250 cfs dam release is representative of wet weather conditions and downstream flows would be expected to be significantly higher due to inflows from natural runoff and the South Anna. The data from the 3 surveys were intended to provide a range of conditions for model calibration, with a focus on low flows. For the North Anna study, the third survey was performed at higher than anticipated flows, which is a benefit to the study by providing model calibration over a wider flow range. The transect data summary table referred to in LACA Comment 2 is attached as Table 1. The table includes the measured field flows and flows interpolated from the 15-minute USGS at the time of each survey. Tab 11 in the notebook provides details on the interpolation of USGS data to the IFIM transects. The flows measured in the field at the IFIM transects are summarized in the following table:

Flows Measured at IFIM Transects

River Reach	Low-flow	Mid-Flow	High-Flow
Piedmont	22-27 July 07 57-69 cfs	3 May 2008 170-205 cfs	1 May 2008 373-447 cfs
Fall Zone	24-25 July 2007 57-73 cfs	4 May 2008 188-240 cfs	2 May 2008 418-446 cfs
N Anna Coastal Plain	26 July 2007 60-66 cfs	8 April 2008 176-212 cfs	2 May 2008 475 cfs
Pamunkey Coastal Plain	26-27 July 2007 111-126 cfs	11 April 2008 704-784 cfs	9 April 2008 1,333-1,362 cfs(a)

a) High flows in the Pamunkey Coastal Plain could not be safely measured, and were predicted based on 15-minute USGS data.

The low-flow surveys were performed during 22-27 July 2007 and the Lake Anna Dam release was held at 40 cfs to the best of Dominion's operational abilities. During this period of time, the USGS was still developing the stage discharge relationships for the re-installed Partlow gage, and flows were not available online. Retroactively, the USGS posted flows of 65-66 cfs on these days. For the May 2008 North Anna surveys, the dam release was 151 cfs during the mid-flow and 372 cfs during the high-flow survey days. The April 2008 surveys at the Pamunkey Coastal Plain stations were performed following rain events and the river flow at these downstream stations was dominated by the discharge from the South Anna. The flow data at these stations show an increasing progression from the low, to mid, and to the high flow surveys, even though the dam releases on the April survey days were 44-54 cfs.

The IFIM Report (p. 10) refers the reader to notebook Tab 11 for a more complete discussion on the lower flow range used in the model. The interpolation of the model to a 20 cfs flow range is also discussed in Hanover Comment #5.

3. Three Inch Rise in Lake Level - We support and agree with the proposed 3 inch rise in standard lake level. Data in the IFIM results and other data provided by Dominion based on modeling of lake levels lead us to the conclusion that the 3 inch rise essentially mitigates the impact of unit 3 on lake levels, except in times of drought. A series of meetings with Dominion resulted in agreement to support and assist with several projects that are designed to make Lake Anna safer and more usable in times of drought – thus addressing the impact of unit 3 in times of drought. We look forward to working with Dominion and others in completing these projects.

RESPONSE: Your support and agreement is acknowledged.

4. Recreational Flows - We support recreational flows to the North Anna River in concept. However, the proposal, as briefed, provide for releases in June and July when the lake is above 250 ft. Our calculations show the lake with 47,190,000 cubic ft per inch of water height. A flow of 177 cfs for 17 hours releases 0.23 inches of lake height for each event. Using the difference between the standard 40 cfs and the 177 cfs each event uses an additional 0.18 inches of lake height. The net cost of the recreational releases should be clarified. If we presume only 5 releases in June and July at 0.23 inches per release, then we have given back more than one third of the mitigation of the loss of the third reactor envisioned by the 3 inch rise. We support recreational releases when the lake is at 250.25, the new full pond under this scenario. If that is not the case then additional data should be added to the IFIM results to add a fourth operational scenario - the actual recommended scenario which includes recreational releases. As it now

stands the report has no data which shows the impact of the third reactor in the actual recommended operational scenario. All conclusions, such as percent of time at 20 cfs, based on scenario 3 (unit three with the 3 inch rise) appear to be suspect by at least 30% and much higher in worst case as compared to the recommended operational scenario.

RESPONSE: While sometimes providing flows amenable to expert canoeists and kayakers, these flows will often exceed the 177 cfs dam release identified as a desirable flow for downstream recreationists. Controlled recreational releases to the North Anna River can be provided by using storage gained by increasing the lake level from 250.0 to 250.25 ft. Use of this storage avoids prolonging the amount of time lake elevations exceed 250.25 ft., and avoids accelerating the drawdown of Lake Anna when lake elevations are less than 250.0 ft. Calculations were performed to determine the number of weekly recreational release flows that could be made in June and July and the resultant change in lake elevation based on the 1979-2007 model data for the EC/MWC at 250.25 ft scenario. The weekly recreational flow was assumed to be 177 cfs for a 17 hour period; a net additional release of 137 cfs relative to the 40 cfs flow when the lake elevation is below 250.25 ft. If the dam flow was already above 177 cfs, this was counted as a release event even though no further action was necessary. The analysis was conducted for June and July because these were the months when recreational flow releases would generally benefit the greatest number of users. The results of this analysis are provided in Table 2.

Based upon the 29 year data record, Table 2 indicates that the total number of release events varied from 0 to 5 during June and July, depending on year. The average number of release events was 2.8 in June and 2.0 in July for a cumulative average total of 4.9 recreational releases per year. The analysis takes into account runoff to Lake Anna replenishing the released volume. For example in June 1995 there were 4 events, and in June 2003 there were 5 events with no change in reservoir elevation at the end of month compared to the original EC/MWC scenario. In August 1984 there were 5 release events, and lake inflow was able to replenish not only the August releases but the 0.18 inch deficit carried over from June. For the combined June and July period, the total elevation decrease in Lake Anna resulting from recreational releases varied from 0.0 to 1.07 inches, with an average of 0.35 inches (0.03 ft). It is noteworthy that during drought periods (e.g., 2001, 2002, 2007), recreational releases would rarely if ever occur because the lower threshold for recreational releases (250.0 ft) is not exceeded.

5. Graduated Release and Return – The report does not address the “gradual release and return flow” over the dam as a mitigation method to reduce the 20cfs flow over the dam. Once the three inch pool level is exhausted due to drought conditions and the lake level is going down, a reduction from 40cfs to 35cfs at 249.5msl, to 30cfs at 249msl, to 25cfs at 248.5msl, to 20cfs at 248msl or lower is prudent. When the lake level increases above 248msl, the release should be held at 20cfs until a level of 250.25 is reached as long as the Doswell USGS gage reads at least 40cfs. The March 4 briefing on the report indicates that "an Agency objective was to minimize frequency of 20 cfs flows". Was a graduated flow concept considered and rejected despite the fact that it achieves the Agency objective of reducing the frequency of 20 cfs flows? If so what was the basis for rejecting it?

RESPONSE: DGIF and DCR have reviewed the IFIM study as well as LACA and FOLA comments in regard to operation of downstream releases when the lake is below full pool. DGIF continues to support the current operating rules due to the adverse impacts on downstream resources when flows are less than 40 cfs. When flows are below 40 cfs habitat is substantially

reduced for smallmouth bass juvenile and adult life stages as well as other species life stages (American shad juvenile, mussels, and shallow and deep fast guilds). As Dominion's IFIM report demonstrates habitat drops rapidly as flows decrease below 40 cfs for many life stages. It is important to recognize that downstream flows have already been altered and the frequency of flows of 40 cfs or less has increased from pre-lake conditions of less than 10% of the time to 40% of the time currently. Reducing the flows by 5 cfs increments has negligible impacts on Lake Anna water levels but can have significant long term impacts on downstream biological health and diversity. Each 5 cfs only improves lake height by .25 inches in a month. In addition, flows of 40 cfs are marginally suitable for recreational use in the upper North Anna and the Coastal area but are unsuitable in the fall Zone area. When flows are below 40 cfs navigability is greatly reduced thereby limiting recreational potential of the downstream resource.

6. Damage to bulkheads and shoreline stabilization – We believe the 3 inch rise will result in some damage to bulkheads and require additional stabilization efforts on the part of some homeowners. Though 92% of respondents supported the 3 inch rise in LACA's 2008 survey, many expressed concern about this potential impact. We request that this issue be identified in the final report and addressed in final implementation planning. At a minimum, we suggest including a short duration test period prior to actual implementation so that owners have an opportunity to identify potential problems and take action before full implementation.

RESPONSE: In recent meetings with LACA and FOLA representatives, Dominion agreed to work cooperatively with the lake stakeholders to address remaining identified issues related to a lake level rise of 3 inches. These issues are mostly related to improving safety and recreational use of Lake Anna during drought periods (e.g., hazard markers, bridge inventory). In addition, Dominion has agreed to pursue installation of an electronic lake level and temperature monitoring system at the dam. It was noted in Dominion's recent meetings with LACA and FOLA representatives that the commitment to implement a 3 inch rise in lake level is contingent upon Unit 3 operation. The potential for a test year prior to Unit 3 operations was discussed. Dominion indicated it was too early to consider this, as the project has many milestones to complete over the next several years including COL approval, SCC approval, and a company decision to build.

7. Conditional Coastal Zone Consistency Satisfied - The DEQ webpage that posted this study and described the comment process indicated (last line) that "the completion of this IFIM study satisfies the special condition in the coastal zone consistency determination for North Anna power station Unit 3". The NRC November 14, 2006 letter (Weisman to Grecheck) and DEQ November 21, 2006 letter (Weeks to Faggert) seem to require more. Those two seem to indicate that the process is not completed until the IFIM results are "implemented through appropriate state or federal permits or licenses". We suggest that this be clarified.

RESPONSE: The referenced condition pertaining to the In-stream Flow Incremental Methodology (IFIM) study that was requested by the Department of Game and Inland Fisheries (VDGIF) contains more than one requirement. The complete wording of this condition is:

Dominion Nuclear North Anna, LLC (Dominion) shall conduct a comprehensive In-stream Flow Incremental Methodology (IFIM) study, designed and monitored in cooperation and consultation with the Virginia Department of Game and Inland Fisheries (VDGIF) and the Virginia Department of Environmental Quality (VDEQ), to address potential impacts of the proposed Units 3 and 4 upon the fishes and other aquatic resources of Lake Anna and

downstream waters. Development of the Scope of Work for the IFIM study shall begin in 2007, and the IFIM study shall be completed prior to issuance of a combined construction and operating license (COL) for this project. Dominion agrees to consult with VDGIF and VDEQ regarding analysis and interpretation of the results of that study, and to abide by surface water management, release, and in-stream flow conditions prescribed by VDGIF and VDEQ upon review of the completed IFIM study, and implemented through appropriate state or federal permits or licenses.

This condition was previously agreed to by Dominion and this condition was included as a commitment in Dominion's application to the Nuclear Regulatory Commission (NRC) for an Early Site Permit (ESP) at the North Anna facility. The NRC subsequently included this condition in the ESP it issued for the facility. The completion of the IFIM study and summary report satisfies one of the requirements in the condition requested by DGIF. As was stated in the Commonwealth's November 21, 2006, response to Dominion's Federal Consistency Certification under Coastal Zone Management Act for its North Anna Early Site Permit application, a second federal consistency certification and review will be required should Dominion later decide to apply to the NRC for a license for nuclear unit construction and operation pertaining to the North Anna facility. Dominion currently has an application for such a license pending at the NRC. However, Dominion has not yet submitted its federal consistency certification for this license. Likewise, Dominion has not submitted any license or permit application to the Commonwealth for North Anna for which the results of the IFIM study would be related. The requirement to obtain and adhere to all the applicable permits and approvals not yet secured for the activities to be performed by Dominion, was also included in the Commonwealth's conditional concurrence of Dominion's Federal Consistency Certification for its North Anna Early Site Permit application. Therefore, Dominion will need to address how it will comply with the additional requirements in the IFIM study condition requested by DGIF: "to consult with VDGIF and VDEQ regarding analysis and interpretation of the results of that study, and to abide by surface water management, release, and in-stream flow conditions prescribed by VDGIF and VDEQ upon review of the completed IFIM study, and implemented through appropriate state or federal permits or licenses," in its federal consistency certification for a license for nuclear unit construction and operation currently pending at the NRC.

8. Correction - Figure 2.1 shows the Randy Carter gage as a USGS gage location. The Randy Carter gage is not a USGS gage.

RESPONSE: The plot key in Figure 2-1 of the IFIM report will be edited to clarify that the "Randy Carter gage" is not a USGS gage station.

9. Response Process – In the 4 March briefing on the draft report, DEQ committed to a response to all questions and comments arising from public input. Will the responses be appended to the final report? If not, how and in what timeframe will responses be made and will they be made public or will we see responses only to our own questions and comments?

RESPONSE: DEQ has provided a copy of all questions and comments received during the informal public comment period and the responses developed by Dominion and the participating agencies in this document. A copy of this document will be sent to the appropriate contact at each of the three organizations which submitted comments during the comment period via electronic mail. Additionally, a public information update about the responses to the public comments and a link to the completed IFIM study report will be posted on the DEQ Internet site.

Hanover County

On April 2, 2009, Hanover County submitted comments on seven topics. Responses to each topic are included below.

Comment 1. The IFIM study states that a weekly time series was used for the analysis. The narrative is unclear, but Hanover assumes that the flow averaged over seven days was used for the monthly and seasonal analysis. Hanover believes that downstream aquatic resources are more likely to depend on flow averages based on a daily series. A weekly average could desensitize the lowest flow conditions, which typically occur on the order of days. Could you please clarify the use of weekly time series and its context in the study? Also, Hanover requests the study analyze impacts on a daily series.

RESPONSE: The Lake Anna Reservoir model outputs weekly average release flows at the dam. The release flow at the dam was then propagated downstream to the 27 IFIM transects using the daily USGS flows at Hart Corner and Hanover. Thus, the incremental runoff between stations was added into the record in a manner that reflected day-to-day changes in downstream flow conditions. The IFIM Report (p 11) states that *"the transect flow for each day was looked up in the corresponding transect WUA/flow relationship"*. All reported summary statistics were based on a daily WUA times-series. The downstream propagation of the flows at the dam was discussed in greater detail in Notebook Tab 11.

Comment 2. The study identifies withdrawal rates for irrigation users, and states these are averaged over the growing season. The IFIM then does not include these water uses because of their reported de minimis levels. Such an approach does not accurately gauge the impact of the withdrawals on the river as they will typically be higher during the hot summer months when the river flow is lower, and are not on a constant basis. Furthermore, an analysis conducted by DEQ PRO in 2002 determined that the Engel Farms withdrawals equated to 2.52 cfs in the North Anna River alone, and that the actual withdrawal capacity was 7.7 cfs. We are therefore concerned that the Report also underestimates the remaining agricultural withdrawals to the same extent. An analysis should include the study of peak day use for all water uses, and in particular during the summer months when dam releases are likely to be at 20 cubic feet per second (cfs). Can the study please clarify how the list of water users was identified? For example, was the list developed using only permitted water users or those users reporting to DEQ? Also, during the field work along the North Anna and Pamunkey Rivers, were the irrigation withdrawals inventoried?

RESPONSE: The response to this Comment has been combined with the response to the related Comment # 3 below.

Comment 3. Hanover understands that an IFIM study is traditionally used for analysis of aquatic habitat for protection of species; however, Dominion cited in its work plan that VDGIF's and DEQ's stated objective for the IFIM is to *"...address potential impacts upon fishes and other aquatic resources of Lake Anna and downstream waters"*. Given that the study did not include water uses such as irrigation (peak use) and potable water, we are concerned that the study may underestimate the impacts during low flow conditions.

RESPONSE TO COMMENTS 2 and 3: The North Anna IFIM transects on the Piedmont, Fall Zone, and Coastal Plain were located between 0.6 and 25.37 miles below Lake Anna Dam. There were no identified water users along this section of the river. Daily flows for the IFIM analysis were calculated at these 23 transects by propagating the predicted operating scenario flow at the dam downstream with the aid of the USGS Hart Corner flow (mile 29.1). See Tab 11 of the IFIM Notebook for more detail. The data from three water users located between the furthest downstream North Anna River IFIM transect (RM 25.37) and the Hart Corner gage were considered as an adjustment to the Hart Corner data when performing this calculation. A seasonal mean irrigation withdrawal of 0.29 cfs (W F Parker) and a 0.17 cfs design flow discharge at the Hanover County WTP were not included since they partially compensate for one another, and the net difference was not judged significant relative to the IFIM analysis. A mean 5.25 cfs withdrawal at the Hanover County WTP was accounted for when using the Hart Corner USGS data to propagate flows downstream from the dam on a daily basis (based upon VDEQ provided data which included monthly data for 2001-2007).

The IFIM transects on the Pamunkey River were located 59-61 miles below the dam, and 13-15 miles downstream from the Hanover USGS gage. Daily flows for the IFIM analysis at these stations were determined based on the USGS Hanover flows corrected by the difference at Lake Anna Dam between existing conditions and the proposed operating scenario. The majority of identified water users along the North Anna (including Kevin Engel, Kings Dominion, and Bear Island Paper) are located between the Hart Corner and Hanover USGS gages, and their withdrawals are already reflected in the Hanover gage data. Between Hanover and the IFIM transects there was one identified irrigation withdrawal with a mean seasonal usage of 0.14 cfs (James Newcomb). This withdrawal was not included in the IFIM analysis.

The change in low flow conditions associated with Unit 3 operation is most readily seen by examining the flow frequency distributions. Table 4-1 of the IFIM Report provides a frequency distribution of flows at the Lake Anna Dam, including existing conditions and the proposed EC/MWC at 250.25 ft Unit 3 operating scenario. The table indicates that the occurrence of a 20 cfs release would increase from 4.6 percent to 5.5 percent-of-time. This 0.9 percent increase corresponds to 14 weeks during the 29 year study period. Further analysis indicated that all of the additional 14 weeks occurred during the months of September to December. Further, all occurrences of a 20 cfs flow during the months of January to August were associated with the 2001-2002 drought. The increased number of 20 cfs flow weeks during the September to December period indicates that Lake Anna is taking a longer time to recover back up to a 248 ft elevation following a previous drought. However, during this “recovery” period, the drought would have already been broken in the remainder of the watershed, and increased runoff would be available to augment the continuing 20 cfs flows at the Lake Anna Dam. In summary, the EC/MWC at 250.25 ft scenario for Unit 3 does not change the availability of water at low river flows compared to existing conditions during the spring and summer growing season.

The IFIM study used monthly water use data provided by VDEQ staff, which was presented in the report as a mean withdrawal during the growing season. Individual daily usage could be higher than the monthly average, but without reliable data, any adjustments would be arbitrary. Differences between peak daily and mean withdrawals do not affect the habitat analysis at the IFIM transects since there were no identified users within these study reaches. The analysis conducted by VDEQ that assigned a 2.52 cfs to Engel Farms was a calculation that assumed 1 inch of irrigation per acre without accounting for prevailing meteorological conditions.

Comment 4. The study does not quantify the relationship between the lake elevation changes and river flow changes/hydrographs downstream of the dam. The study discusses the affect on weighted usable areas (WUA's) downstream; however, the importance of the overall downstream flow regime should not be lost in the study for purposes of protecting downstream resources. With a lake release reduction from 40 cfs to 20 cfs over an extended period, what is the resulting affect on the lake elevation?

RESPONSE: The effect of operating Unit 3 on lake elevation was discussed in Section 4.1.1.2 of the IFIM Report, and Table 4-2 provided a frequency distribution of Lake Anna elevations including existing conditions and the proposed EC/MWC at 250.25 ft Unit 3 scenario. For the proposed EC/MWC at 250.25 scenario, by starting at the beginning of most years at a 0.25 ft higher elevation, the lake will maintain a higher elevation than under existing conditions for 75 percent of the time. With the increased consumptive use from Unit 3, combined with a prolonged drought, the initial additional volume associated with the 0.25 ft rise would be consumed, and lake elevations would eventually fall below existing conditions. The decrease from a 40 cfs to a 20 cfs dam release is triggered by the lake elevation falling to 248.0 ft. The increased length of time that the lake would remain at or below 248 ft is the same 0.9 percent increase associated with the 20 cfs flow. The response to Comments 2 and 3 (see above) indicated that this 0.9 percent increase occurred during the months of September to December. A prolonged 20 cfs flow release occurred during the 2001-2002 drought. Table 4-2 in the IFIM Report indicates that the minimum lake elevation reached during this event was 245.06 ft for existing conditions and would be 244.30 ft for the EC/MWC at 250.25 ft Unit 3 scenario.

Comment 5. Sections 1.4 and 4.1 of the North Anna IFIM Study Plan indicate that the collection of field data would occur at flows of 40, 140, and 250 cfs, which would be used to simulate a range of 20 cfs to 500 cfs. However, the lowest measured flow in the field was 60 cfs, which does not follow the Study Plan. The study uses the measured 60 cfs flow to extrapolate down to a flow of 20 cfs. This extrapolated flow of 20 cfs is beyond the 0.4 limit recommended by PHABSIM. PHABSIM notes that extra care should be taken if the user is to extrapolate beyond the recommended limits. Given the fact that the upper portion of the river relies almost entirely on discharge from the dam, we question the validity of extrapolating beyond the 0.4 limit. Can the impact of 20 cfs discharge truly be extrapolated from higher flows? Although the report notes the drainage area increases as you move downstream from the dam, during low flow conditions there is very little, if any, additional water entering the North Anna River. As we experienced in 2007, the North Anna Flow in the Doswell area was in the 8 cfs range, even with a 20 cfs release from the dam. The decision to suspend the study during the period of low flow resulted in the loss of an opportunity to evaluate the impact of the lower release rate during actual conditions. Pictures with graphs depicting the corresponding North Anna River flows are attached illustrating the water levels of the North Anna during this time. These pictures and graphs support Hanover's belief that some withdrawals are underestimated.

RESPONSE: The IFIM study plan indicated that the field surveys would be performed with target flows of approximately 40 cfs, 140 cfs, and 250 cfs measured at the Lake Anna Dam. Downstream river flows would increase from these levels as a result of natural runoff conditions at the time of the survey. The resulting 20 cfs to 500 cfs flow range for the model is for releases at the dam, and the corresponding flows at downstream IFIM transects would be progressively greater. During the low flow July 2007 field surveys, dam releases were 40 cfs within Dominion's operational capabilities [see Response to LACA Comment #2]. The collection of field flows greater than 40 cfs is not contrary to the study plan.

As stated in the study plan, it is generally reported that PHABSIM can provide representative extrapolation of habitat/discharge relationships down to 0.4 times the lowest measured flow and up to 2.5 times the highest flow. In the following sentence the PHABSIM manual also notes that usage down to times 0.2 has also been reported. The manual cautions that these are only reported ranges, that from a functional perspective none of the PHABSIM models are inherently restricted to any flow range, and that a simulation range should be based on model performance and not an arbitrary "rule of thumb".

For the North Anna IFIM study, extrapolating beyond the 0.4 limit is considered a valid model application. A primary consideration is that the flow range in question is less than 1 percent of the calibration flow range. The "recommended" 0.4 limit on a 60 cfs flow in the Piedmont is 24 cfs. A 20 cfs flow occurs only at the dam and the flow is commonly greater at the downstream IFIM transects. Therefore, the actually modeled flows are not significantly different from the 0.4 limit. Recognize that this differs from a hypothetical situation where the minimum calibration flow was 500 cfs such that the 0.4 limit provided a 200 cfs minimum flow for analysis. In this case, extending the model down to 20 cfs or 40 cfs may clearly be beyond a reliable application range. For many species including those of particular interest for the study (northern hog sucker, American shad, and mussels), the WUA curves as a function of flow are at very low values approaching the zero origin at 40 cfs. Extending this trend line from 40 cfs to 20 cfs is well within the calibration accuracy of the model. The extended low flow limit was discussed with, and approved by VDGIF staff.

As noted by in the County's comments, during October 2007, with a 20 cfs release at Lake Anna Dam, downstream flows at Hart Corner and Doswell decreased to approximately 8 cfs on 12-13 October. This decrease is likely, at least in part, associated with withdrawals by water users. However, with the operation of Unit 3, the same 20 cfs dam release will be in effect such that there will be no change from existing conditions. It should also be noted that the required 20 cfs dam release under these drought conditions was 30 percent higher than the natural flow in the South Anna River for a similar sized drainage area.

Comment 6. Why has the study limited its analysis to a lake level increase of 3 inches to 250.25 ft? Discussion during the March 4, 2009 stakeholders meeting indicated it was believed that the 250.25 ft was acceptable to the lake stakeholders, which is why it was selected. It was not based on an evaluation of the impact of higher elevations, although the North Anna IFIM Study Plan notes consideration of 250.3 ft would be acceptable to VDGIF. Also, Section 5 – Reservoir Study, discusses review of elevations from 248 ft to 251 ft and indicates transects extended landward to an elevation of 252 ft for evaluation purposes. The study also notes that with the third reactor, the occurrence of 20 cfs flow increases from 4.6% to 6.3% for an increase of 36%. The additional 3 inch lake elevation results in a 5.5% occurrence of 20 cfs flow or an increase of over 19% from current conditions. At what lake elevation is the affect of the third reactor eliminated? What would be the impact of an increase of 6 inches or more? Please explain why a lake level increase of 3 inches was chosen, and why other levels were not analyzed.

RESPONSE: It is estimated that most of the impact of Unit 3 in increasing future 20 cfs drought flows downstream could be mitigated with a lake level increase of about 7-7.5 inches. Dominion did not pursue this option due primarily to concerns raised by lake stakeholders on impacts to shoreline structures such as docks and bulkheads. They were agreeable to a 3 inch rise, although they are still requesting additional studies to assess any impacts with this increase. Also, a 7-7.5 inch rise would be expected to increase any impacts to wetlands. It is noteworthy that the proposed 3 inch rise was acceptable to the staff of the resource agencies for mitigation of the frequency of drought flows downstream (i.e. a reduction from current conditions of 6.3% to 5.5%).

In addition as noted at our March 4 meeting, Dominion will have to obtain concurrence from FERC on any lake level rise with a potential for expensive modifications to the dam. The higher the rise in lake level the higher the risk is for FERC to require these modifications.

Comment 7. The IFIM study does not reconcile the minimum North Anna flow of 20 cfs with the Commonwealth's resource agencies' positions in 1970. At that time it was believed by the Virginia Institute of Marine Science and the Department of Conservation and Economic Development that the annual instantaneous flow release from the lake to the North Anna River should not be less than 60 cfs and that it should be increased to 100 cfs from June through September. The memo to the State Water Control Board members dated November 13, 1970 noted concerns about the impact on salinity and fisheries habitat, specifically noting nursery and spawning areas. The 40 cfs minimum release rate was established by the State Corporation Commission as a balance between the interests of lake and downstream users. A complete summary of the history of the minimum release rate with supporting documentation has been provided to DEQ with each comment letter submitted by Hanover throughout this process but has not yet been addressed. The background information is incorporated herein by reference.

RESPONSE: The 37 years of flows resulting from the existence and operation of the dam are now considered the norm for the North Anna River. The flow recommendations made to the State Water Control Board in the early 1970s are no longer relevant. The State Water Control Board reaffirmed the 40cfs minimum release and the 20cfs Lake Level Contingency Plan minimum release in 2001 and 2007. The flows in the river have provided a viable aquatic community as well as provide for other beneficial uses. From the beginning of the IFIM study, there was no intention to return to the flows that preceded the dam; the intentions were to keep the flow frequencies as close to the existing condition as possible.

Mr. Harry Ruth For the Friends of Lake Anna

On April 2, 2009, Mr. Harry Ruth submitted comments for the Friends of Lake Anna on six topics. Responses to each topic are included below.

1. IFIM Requirements – The IFIM study was “to address the potential impacts of the proposed Unit 3 and 4 upon the fishes and other aquatic resources of Lake Anna and downstream waters,”. There is no reference to Unit 4 in the draft IFIM report. We recommend that a statement be added that explicitly states that Unit 4 cannot be considered during this IFIM study, since there is absolutely no information available other than the term "DRY COOLING". concerning Unit 4.

Our understanding from Dominion and internet research is that there are currently NO nuclear reactors throughout the world that use exclusively dry cooling. As a result, there is no information available re dry cooling water impacts for nuclear reactors (or makeup water needed for any dry cooling process). Therefore it is currently impossible to assess the potential impacts of Unit 4 upon the fishes and other aquatic resources of Lake Anna and downstream waters.

RESPONSE: The IFIM report addresses proposed Unit #3 because that is the only facility being proposed for permitting at this time. Unit #4 is not being considered for construction, and is not part of Dominion’s regulatory proposal before the Nuclear Regulatory Commission or the Virginia resource agencies. Note, however, that if Unit #4 would be proposed in the future, no water impacts would be expected since the dry towers would use almost no water (<1 gpm on average) during operation. This was described in detail in Dominion’s ESP application to the Nuclear Regulatory Commission. Text will be added to the IFIM report indicating that the results apply only to the operation of Unit #3.

2. The Conditional Certification of the U.S. Coastal Zone Management Program for the Early Site Permit for Units 3 and 4 as part of the IFIM study should not be granted at this time. The IFIM certification should be deferred until (1) The state and federal permits for both Units 3 and 4 are implemented and (2) IFIM specific potential impacts upon the fishes and other aquatic resources of Lake Anna and downstream waters can be responsibly addressed for Unit 4. The last line of the DEQ webpage re the comment process for the North Anna IFIM study indicates “the completion of this IFIM study satisfies the special condition in the Coastal Zone consistency determination for North Anna Power Station Unit 3”.

The NRC Nov 14, 2006 letter and VDEQ Nov 21, 2006 letter re this subject indicates that the process is not completed until the IFIM results are “implemented through the appropriate state or federal permits or licenses” Please identify all the state and federal permits and licenses that are required for this implementation process before the IFIM study can be completed and an approximate time table for their draft’s review.

RESPONSE: Please see response to similar LACA comment #7 above. Please also see Table 3 regarding permits and the project schedule.

3. Questions/Comments re future Lake Levels and the modeling of data presented for the 3 inch rise in the standard lake level.

a. We support the 3 inch rise in the standard lake level. We also recommend that some preliminary tests be accomplished to determine if there are any adverse unforeseen impacts and if necessary, what remedial actions Dominion can take to overcome the impacts. The 3 inch rise appears to mitigate many of our concerns with the impact of the 3rd reactor.

b. Did all the modeling data and briefing charts for the 3 inch rise for the IFIM calculations take into consideration the frequency and duration of times that Dominion plans to use the Energy Conservation Mode (ECC) when the lake level is below 250 MSL because of high electricity demand?. . If not, what are the changes in the IFIM charts presented that would have resulted in its inclusion?

Note that the NRC Safety Report as a result of Dominion's COL application and also confirmed in Dominion's 30 Jan 09 email to the Lake Anna Task Force that Dominion intends to turn off the dry tower fans and operate in the ECC mode during periods of peak electricity demand regardless of the lake level. As a result of Dominion's stated goal, what time and frequency limits and in what permits is VDEQ planning to minimize any of this operational scenario impacts that Dominion has defined? -or - Do we possibly have a misunderstanding of Dominion's statements ?

This high electricity demand would most likely occur during the hot summer months when the lake is typically at its lowest water level and could exasperate any drought condition. The ECC mode can cause up to an additional 8 million of gallons of water use per day versus the Maximum Water Conservation (MWC) that was defined in the NRC Environmental Report as the operational scenario when the lake was below 250 MSL . This stated goal will cause lake level declines

RESPONSE TO 3(a): In recent meetings with LACA and FOLA representatives, Dominion agreed to work cooperatively with the lake stakeholders to address remaining issues identified related to a lake level rise of 3 inches. These issues are mostly related to improving safety and the recreational use of the lake during drought periods (e.g., hazard markers, bridge inventory). In addition, Dominion has agreed to pursue installation of an electronic lake level and temperature monitoring system at the dam.

It was also noted in a recent meeting that the commitment to implement a 3 inch rise in lake level is contingent upon Unit 3 operation. Dominion also discussed the potential for a "test year" prior to Unit 3 operations, and indicated it was too early to consider this as the project has many significant milestones to complete over the next several years including COL approval, SCC approval, and a Company's final decision to construct Unit #3.

It should also be noted that lake levels at (and substantially above) 250.25 feet have occurred many times over the years after heavy rain events.

RESPONSE TO 3(b): The proposed current operating strategy would be as follows:

<u>Lake Level (ft.)</u>	<u>Dam Release Flow</u>	<u>EC/MWC Mode</u>
= 250.25	= 40 cfs ¹	EC
= 250.0 to < 250.25	40 cfs ¹	EC
> 248.0 to < 250.0	40 cfs	MWC ^{2,3}
= 248.0	20 cfs	MWC ³

¹ Provide weekend recreational flows during June and July when lake level is > 250.0 ft.

² Allow up to seven consecutive days when the lake level is < 250.0 ft. before switching modes each time to place the dry tower in service

³ Annual allowance when lake level is < 250.0 ft. to operate in EC mode only (dry tower fans off) for up to 100 hours/calendar year to meet high electricity demand

Operating strategy support for Note 3 above:

The use of EC mode when the lake level is < 250.0 ft. would be limited to times when the demand on the Dominion electrical grid is high enough to require the costly off-system purchase of electricity and the use of the most expensive generating units to meet our customers' needs. During the warmer months (May – September), this condition is expected to occur only during daylight hours and when the outside temperature is high (typically > 90 F) and the dry tower is least efficient. The estimated increase in water consumption when the dry tower fans would be turned off (EC mode) was calculated from differences in summer evaporation rates between the EC and MWC modes obtained from the cooling tower model. The difference between the maximum evaporation rates of the EC and MWC modes was 11.1 cfs, which represents the increase in water consumption when operating in EC mode during these warmer months. The actual increase in water consumption is expected to be less because the dry tower fans would only be turned off during the warmest part of the day, and turned back on as the outside temperature and electrical demand drops. As the temperature drops and the dry tower efficiency increases, the dry tower would be placed back in MWC service.

While this operating exception to meet power needs is currently expected to be used only infrequently in future years (i.e. perhaps only for several days in a year), it is difficult to predict with confidence how many hours will be actually needed. Therefore, to limit this condition to ensure that any impacts to lake levels are very small and that there is no significant impact to the IFIM study results, Dominion assessed various operating hour scenarios using the 11.1 cfs estimated water loss. It was determined that an annual allowance of 100 hours would at a maximum be the equivalent of less than 0.1 inch loss in lake level. Therefore, the potential impact to lake level is considered very small.

During a typical year and when lake levels are > 248.0 ft and < 250.0 ft, there would be no change in the 40 cfs release and therefore no change in WUA results for the North Anna or Pamunkey Rivers. During a drought year, the 20 cfs transition would be expected to occur only

several hours earlier, based on a 0.23 inch/day historical rate of lake level decrease during drought periods.

The impacts to the results of the IFIM study with a 100 hour allowance would be negligible and does not invalidate or change the conclusions of the IFIM study. Therefore, a 100 hour allowance for this operating condition is considered reasonable with very limited impacts to lake levels or river flows.

4. Water Releases from the Lake. The IFIM report does not address “gradual releases and return flows” over the dam as a mitigation method to reduce the 20 CFS flow over the dam. If the 3 inch rise is exhausted due to (1) Recreational Flows (2) High Electricity Demands and running in the ECC mode (3) normal summer evaporative loss and/or (4) drought conditions and the lake level is in a downward trend, then it appears that a gradual reduction from 40 cfs, to 35cfs at 249.5 msl, to 30 cfs at 249 msl, to 25 cfs at 248.5 msl, to 20 cfs at 248 msl or lower should be accomplished.

Likewise when the lake level increases above 248 msl, the release should be held at 20cfs until a level of 250.25 is reached as long as the USGS gage at Doswell reads at least 40 cfs.

Please comment on VDEQ’s and VDGIF’s position on this graduated water release and retention possibility?

RESPONSE: DGIF and DCR have reviewed the IFIM study as well as LACA and FOLA comments in regard to operation of downstream releases when the lake is below full pool. DGIF continues to support the current operating rules due to the adverse impacts on downstream resources when flows are less than 40 cfs. When flows are below 40 cfs habitat is substantially reduced for smallmouth bass juvenile and adult life stages as well as other species life stages (American shad juvenile, mussels, and shallow and deep fast guilds). As Dominion’s IFIM report demonstrates habitat drops rapidly as flows decrease below 40 cfs for many life stages. It is important to recognize that downstream flows have already been altered and the frequency of flows of 40 cfs or less has increased from pre-lake conditions of less than 10% of the time to 40% of the time currently. Reducing the flows by 5 cfs increments has negligible impacts on Lake Anna water levels but can have significant long term impacts on downstream biological health and diversity. Each 5 cfs only improves lake height by .25 inches in a month. In addition, flows of 40 cfs are marginally suitable for recreational use in the upper North Anna and the Coastal area but are unsuitable in the fall Zone area. When flows are below 40 cfs navigability is greatly reduced thereby limiting recreational potential of the downstream resource.

5. Recreational Flows in the North Anna River. The concept of recreational flows to the North Anna River makes sense if the lake level is above 250’ and 3 inches. We would recommend that this occur in the spring months when rain is typically prevalent to replenish the water released for the recreational flow. We cannot support the Recreational Flow in the summer months when the lake is below 250’ and 3 inches as this proposal would negate a portion, if not all, the 3 inch rise in lake levels and cause a definite negative impact of the 3rd reactor and the recreation aspects of Lake Anna.

Please identify any other scenarios for recreational releases and how the Lake Anna public would be aware of any releases for the benefit of downstream recreational users.

RESPONSE: Under the proposed operating conditions, at lake elevations greater than 250.25 ft. flows to the North Anna River will be increased to bring the lake down to 250.25 ft in a controlled manner. While sometimes providing flows amenable to expert canoeists and

kayakers, these flows will often exceed the 177 cfs dam release identified as a desirable flow for downstream recreationists. Controlled recreational releases to the North Anna River can be provided by using storage gained by increasing the lake level from 250.0 to 250.25 ft. Use of this storage avoids prolonging the amount of time lake elevations exceed 250.25 ft., and avoids accelerating the drawdown of Lake Anna when lake elevations are less than 250.0 ft.

Calculations were performed to determine the number of weekly recreational release flows that could be made in June and July and the resultant change in lake elevation based on the 1979-2007 model data for the EC/MWC at 250.25 ft scenario. The weekly recreational flow was assumed to be 177 cfs for a 17 hour period; a net additional release of 137 cfs relative to the 40 cfs flow when the lake elevation is below 250.25 ft. If the dam flow was already above 177 cfs, this was counted as a release event even though no further action was necessary. The analysis was conducted for June and July because these were the months when recreational flow releases would generally benefit the greatest number of users. The results of this analysis are provided in Table 2.

Based upon the 29 year data record, Table 2 indicates that the total number of release events varied from 0 to 5 during June and July, depending on year. The average number of release events was 2.8 in June and 2.0 in July for a cumulative average total of 4.9 recreational releases per year. The analysis takes into account runoff to Lake Anna replenishing the released volume. For example in June 1995 there were 4 events, and in June 2003 there were 5 events with no change in reservoir elevation at the end of month compared to the original EC/MWC scenario. In August 1984 there were 5 release events, and lake inflow was able to replenish not only the August releases but the 0.18 inch deficit carried over from June. For the combined June and July period, the total elevation decrease in Lake Anna resulting from recreational releases varied from 0.0 to 1.07 inches, with an average of 0.35 inches (0.03 ft). It is noteworthy that during drought periods (e.g., 2001, 2002, 2007), recreational releases would rarely if ever occur because the lower threshold for recreational releases (250.0 ft) is not exceeded.

6. Instream Studies re Lake Anna and the North Anna River. The IFIM study was “to address the potential impacts of the proposed Unit 3 and 4 upon the fishes and other aquatic resources of Lake Anna and downstream waters. The current IFIM study appeared to focus on the downstream fish and recreation impacts with some lake level projections for a 3 inch rise. It provided very little or no data on the potential impacts to the health, safety and welfare of Lake Anna Recreation (marina’s, businesses, homeowners and user’s for boating, swimming, water sports, etc.) or the potential impacts to the major Lake Anna State Park used by hundreds of thousands of Virginia citizens each year and the health and safety of each. Please explain why there was little focus on the potential impacts of the 3rd reactor to Lake Anna as opposed to downstream.

RESPONSE: DGIF has reviewed several pieces of information regarding effects of water level on recreational usage of the lake. None of them have shown an effect of low water levels on usage. We examined boat accidents for Lake Anna and showed no correlation with water level. We reviewed marina launch data and again showed no correlation between water level and launches. Finally we reviewed monthly Lake Anna park data and showed no correlation between water level and attendance at the park other than for the month of October. Low water levels may pose problems for waterfront property owners who are situated in shallow coves but for overall effects on total recreation we can detect no impacts. In fact some of the data points to increasing usage when the lake was low and the weather hot.

Additional Text Changes to the IFIM Report

Text to be included at end of first paragraph in Executive Summary and Introduction related to Unit 4 - This IFIM study does not directly address any impacts of a potential Unit 4. The Early Site Permit, as issued by the Nuclear Regulatory Commission, requires that a potential Unit 4 utilize dry cooling, and therefore a Unit 4 would have negligible impact on the consumptive use of water. In addition, the Combined Operating License (COL) application, submitted to the NRC in November 2007, was for Unit 3 only, and there are no present plans to develop a Unit 4 at the site.

Text to be included as a footnote in Executive Summary, Results and Conclusion sections related to the frequency at 20 cfs - The percentage values calculated for the time at 20 cfs in this IFIM Report differ slightly from the calculated percentage values in the Unit 3 COL application (4.7, 6.5, and 5.7 % for the three scenarios, respectively). This is because 29 years (based on USGS water years) of data with seasonal averaging were used for this IFIM Report while 29 years plus one month (based on maximizing the time duration of the analysis) were used in the COL application.

On page 1 in third paragraph – add “Unit #3” before the words IFIM study

In Figure 2-1, note that Randy Carter Gage is not a USGS gage

In Table 2-1, add footnote to indicate that the data were obtained from VDEQ

On page 8 in first paragraph – add the following sentence at end of paragraph: *Relic L. radiata shells have been found in the Pamunkey River (B. Watson, VDGIF, personal communication).*

Text to be included at end of third paragraphs on page ES-4 and page 38 to clarify wetland impacts based upon discussions with staff from VDEQ and USACE-Norfolk related to the Joint Permit Application (JPA) - However there may be a temporary alteration of function that is expected to stabilize over time. These changes to shoreline wetland function would require permitting coordination through the Joint Permit Application process.

Text to be included in second paragraph on page 20 in response to a comment from DGIF

VDGIF noted that the amount of WUA present for post-impoundment conditions may have been overestimated because the post-impoundment period appears to be wetter than pre-impoundment. Evidence of this was provided by the post-impoundment mean flow for the North Anna River closely matching that for the pre-impoundment period, despite increased evaporation after impoundment. Precipitation data at the Richmond International Airport indicate that the post impoundment period was 2.1 percent wetter than a comparable 29-year pre-impoundment period; however, it is difficult to quantify how differences in rainfall may have affected estimates of river flow and calculated WUA values. Because the analyses in this report examined the differences between various operating scenarios in comparison to existing conditions during the post-impoundment period, they are not affected by any differences in pre- and post-impoundment flows.

ATTACHMENTS

Table 1- Summary of Transect Data for the IFIM Surveys Including Measured Field Flows and Extrapolated Flows Using USGS Data, 2007-2008

Table 2- Modeled Number of June and July Recreational Releases and Resulting Decrease in Lake Anna Elevation, EC/MWC at 250.25 ft Scenario

Table 3- Proposed NAPS Unit 3 Environmental Permit List and Schedule (April 20, 2009)